HRS DOCUMENTATION RECORD – REVIEW COVER SHEET

Name of Site:	Bremerton Gasworks

Contact Persons:

Removal Action	Anchor QEA, LLC, January 2011, Completion Report, Former Bremerton MPG Site, Incident Action and Time Critical Removal Action
Emergency Removal Action	Ecology and Environment, Inc., March 2011, Bremerton MGP Waste Release Emergency Removal Action
Targeted Brownfields Assessment	Ecology and Environment, Inc., August 2009, Final Bremerton Gasworks Targeted Brownfields Assessment, Bremerton, Washington
Documentation Record	Renee Nordeen, Ecology & Environment, Inc., Seattle, WA Ken Marcy, U.S. Environmental Protection Agency, Seattle, WA

Pathways, Components, or Threats Not Scored
The ground water migration pathway, ground water-to-surface water component and drinking water threat of the surface water migration pathway, soil exposure pathway, and air migration pathway were not scored as part of this Hazard Ranking System (HRS) evaluation. These pathways/components were not included because a release to these media does not significantly affect the overall site score and because the overland flow/flood component of the surface water migration pathway produces an overall site score well above the minimum required for the site to qualify for inclusion on the National Priorities List. These pathways are of concern to the U.S. Environmental Protection Agency (EPA) and may be evaluated during future investigations.

HRS DOCUMENTATION RECORD

Name of Site: Bremerton Gasworks

EPA Region 10 Date Prepared: September 2011

CERCLIS No.: WAN001002907 Modified: May 2012

Street Address of Site*: 1725 Pennsylvania Avenue, Bremerton, Washington 98337

County and State: Kitsap, Washington

General Location in the State: Northwest

Topographic Map: Bremerton West, Washington, 1953, photorevised 1981 (Ref. 3).

Latitude: 47° 34 42.76" North Longitude: 122° 38' 31.69" West (Ref. 3 as determined as the end of the concrete pipe)

Scores	
Ground Water Pathway	NS
Surface Water Pathway	100.00
Soil Exposure Pathway	NS
Air Pathway	NS
HRS SITE SCORE	50.00

NS = Not Scored

* *- The street address, coordinates, and contaminant locations presented in this HRS documentation record identify the general area the site is located. They represent one or more locations EPA considers to be part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not precisely delineated boundaries. A site is defined as where a hazardous substance has been "deposited, stored, placed, or otherwise come to be located." Generally, HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under the Comprehensive Environmental Response, Compensation, and Liability Act. Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed as to where the contamination has come to be located.*

SURFACE WATER OVERLAND FLOW/FLOOD MIGRATION COMPONENTS SCORESHEET

Factor categories and factors			Maximum Value	Value Assigned	
	Drinking Water Threat				
Likelihood of Release:					
	1. Observed Release		550	550	
	2. Potential to Release by Overland Flow:				
		2a. Containment	10		
		2b. Runoff	25		
		2c. Distance to Surface Water	25		
		2d. Potential to Release by Overland Flow [lines 2a(2b + 2c)]	500		
	3.Potential to Release by Flood:				
		3a. Containment (Flood)	10		
		3b. Flood Frequency	50		
		3c. Potential to Release by Flood (lines 3a x 3b)	500		
	4. Potential to Release (lines 2d + 3c, subject to a maximum of 500)		500		
	5. Likelihood of Release (higher of lines 1 and 4)		550		550
Waste Characteristics:					
	6. Toxicity/Persistence		(a)		
	7. Hazardous Waste Quantity		(a)		
	8. Waste Characteristics		100		NS
Targets:					
	9. Nearest Intake		50		
	10. Population:				
		10a. Level I Concentrations	(b)		
		10b. Level II Concentrations	(b)		
		10c. Potential Contamination	(b)		
		10d. Population (lines 10a + 10b + 10c)	(b)		
	11. Resources		5		
	12. Targets (lines 9 + 10d + 11)		(b)		NS
Drinking Water Threat Score:					
	13. Drinking Water Threat Score [(lines 5x8x12)/82,500, subject to a max of 100]		100		NS
Factor categories and factors			Maximum Value	Value Assigned	
	Human Food Chain Threat				
Likelihood of Release:					
	14. Likelihood of Release (same value as line 5)		550		550
Waste Characteristics:					
	15. Toxicity/Persistence/Bioaccumulation		(a)	5×10^8	
	16. Hazardous Waste Quantity		(a)	100	
	17. Waste Characteristics		1,000		320
Targets:					
	18. Food Chain Individual		50	45	
	19. Population				
		19a. Level I Concentrations		0	
		19b. Level II Concentrations		0.03	
		19c. Potential Human Food Chain Contamination		0.31	
		19d. Population (lines 19a + 19b + 19c)		0.34	
	20. Targets (lines 18 + 19d)		(b)		45.34
Human Food Chain Threat Score:					

	21. Human Food Chain Threat Score [(lines 14x17x20)/82,500, subject to max of 100]		100		96.72
Factor categories and factors			Maximum Value	Value Assigned	
Environmental Threat					
Likelihood of Release:					
	22. Likelihood of Release (same value as line 5)		550		550
Waste Characteristics:					
	23. Ecosystem Toxicity/Persistence/Bioaccumulation		(a)	5×10^8	
	24. Hazardous Waste Quantity		(a)	100	
	25. Waste Characteristics		1,000		320
Targets:					
	26. Sensitive Environments				
		26a. Level I Concentrations	(b)	0	
		26b. Level II Concentrations	(b)	175	
		26c. Potential Contamination	(b)	0	
		26d. Sensitive Environments (lines 26a + 26b + 26c)	(b)	175	
	27. Targets (value from line 26d)		(b)		175
Environmental Threat Score:					
	28. Environmental Threat Score [(lines 22x25x27)/82,500, subject to a max of 60]		60		60
	29. Watershed Score[c] (lines 13 + 21 + 28, subject to a maximum of 100)		100		100.00
	30. Component Score (S_{of})[c] (highest score from line 29 for all watersheds evaluated, subject to a maximum of 100)		100		100.00

[a] Maximum value applies to waste characteristics category.
[b] Maximum value not applicable.
[c] Do not round to nearest integer.

WORKSHEET FOR COMPUTING HRS SITE SCORE

	S pathway	S^2 pathway
Ground Water Migration Pathway Score (S_{gw})	NS	NS
Surface Water Migration Pathway Score (S_{sw})	100.00	10000
Soil Exposure Pathway Score (S_s)	NS	NS
Air Migration Score (S_a)	NS	NS
$S^2_{gw} + S^2_{sw} + S^2_s + S^2_a$		10000
$(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4$		2500
$\sqrt{(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4}$		50.00

REFERENCES

Reference Number	Description of the Reference
1.	U.S. Environmental Protection Agency, December 14, 1990, Hazard Ranking System, Final Rule, 40 CFR Part 300, 14 pages excerpted. A full copy of the HRS Rule is available in the Regional docket, upon request.
2.	U.S. Environmental Protection Agency, January 2004, Superfund Chemical Data Matrix (SCDM), Appendix BI, 13 pages excerpted. A complete copy of SCDM is available at http://www.epa.gov/superfund/sites/npl/hrsres/tools/scdm.htm.
3.	U.S. Geological Survey, 1953, photorevised 1981, 7.5 minute series topographic map, Bremerton West quadrangle, 1 page.
4.	Anchor QEA, LLC, January 2011, *Completion Report, Former Bremerton MPG Site, Incident Action and Time Critical Removal Action*, prepared for U.S. Coast Guard Sector Puget Sound Incident Management Division, prepared on behalf of Cascade Natural Gas Corporation, 383 pages.
5.	Vasser, Bryan, March 2011, Ecology and Environment, Inc., START-3 Project Manager memorandum regarding Bremerton MGP Waste Release Emergency Removal Action to Renee Nordeen, Ecology and Environment, Inc., START-3 Project Manager, with attached figure, chain of custody forms, site photographs, laboratory sheets, and GPS locations table, explaining sampling methodology, analytical protocol, and GPS information, 72 pages.
6.	Ecology and Environment, Inc., July 5, 1984, memorandum from Jim Pitts to Dave Buecker regarding coal and oil gasification plants in Region 10, 117 pages
7.	Ecology and Environment, Inc., August 2009, *Final Bremerton Gasworks Targeted Brownfields Assessment Report*, Prepared for United States Environmental Protection Agency, Contract Number EP-S7-06-02, Technical Direction Document Number 07-01-0008, 1,115 pages.
8.	Ecology and Environment, Inc., March 2008, *Sampling and Quality Assurance Project Plan, Bremerton Gasworks Targeted Brownfields Assessment*, prepared for U.S. Environmental Protection Agency, Contract Number EP-S7-06-02, Technical Direction Document Number 07-01-0008, 199 pages.
9.	Woodke, Mark, April 4, 2011, START-3 Chemist, Ecology & Environment Inc. memorandum to Renee Nordeen, Project Manager, Ecology & Environment Inc. regarding TDD: 10-11-0007, Example adjusted CRQL calculation for the Emergency Removal Action, 69 pages.
10.	Ecology and Environment, Inc., March 2011, Bremerton Gasworks, Zone of Actual Contamination, 1 page.
11.	United States Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, September 2002, Toxicological Profile for Wood Creosote, Coal Tar Creosote, Coal Tar, Coal Tar Pitch, and Coal Tar Pitch Volatiles, 394 pages.
12.	U.S. Environmental Protection Agency, February 1988, *U.S. Production of Manufactured Gases: Assessment of Past Disposal Practices*, 410 pages.
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15.	Reference reserved.
16.	United States Environmental Protection Agency, November 1996, *Using Qualified Data to Document an Observed Release and Observed Contamination*, EPA 540-F-94-028, 18 pages.
17.	Ecology and Environment, Inc., 2009, Bremerton Gasworks Properties, Field Logbooks, 22 pages.
18.	TechLaw, Inc., November 10, 2006, Old Bremerton Gasworks Site McConkey Property Targeted Brownfields Assessment, prepared for United States Environmental Protection Agency, Contract

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Reference Number	Description of the Reference
	Number EP-S7-06-03, Task Order 06-07-0005, 216 pages.
19.	Western Regional Climate Control Center (WRCC), October 4, 2010, Period of Record Monthly Climate Summary Bremerton, Washington (450872), webpage http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?wa0872 accessed on October 4, 2010, 1 page.
20.	Maguire, Andrew, March 31, 2011, Ecology and Environment, Inc., GIS Analyst, memorandum regarding GIS Analysis of Environmental Targets and Sample Distances for Bremerton Gasworks Property to Renee Nordeen, Ecology and Environment, Inc., Project Manager, 3 pages.
21.	GeoEngineers, Inc., June 1, 2007, *Preliminary Upland Assessment Work Plan McConkey/Sesko Site*, prepared for City of Bremerton, 62 pages.
22.	United States Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, June 1995, Toxicological Profile for Fuel Oils, 231 pages.
23.	Agency for Toxic Substances and Disease Registry, September 1996, Automotive Gasoline, ToxFAQs, 2 pages.
24.	US EPA Contract Laboratory Program Generic Chain of Custody, various dates, to KAP Technologies, Inc., Bonner Analytical Testing Co., and Manchester Environmental Laboratory, 27 pages.
25.	O'Sullivan, Allison, Biologist Suquamish Tribe, April 6, 2011, letter to Renee Nordeen regarding Bremerton Gasworks Beach fishing, Project Manager, Ecology and Environment, Inc., 3 pages.
26.	Nordeen, Renee, June 9, 2011, START-3 Project Manager, Ecology & Environment Inc. memorandum to Bremerton Gasworks file, regarding Bremerton Gasworks Property Identification, 1 page.
27.	Woodke, Mark, March 21, 2011, START-3 Chemist, Ecology & Environment Inc. memorandum to Renee Nordeen, Project Manager, Ecology & Environment Inc. regarding TDD: 10-11-0007, Example SQL calculations for the Emergency Removal Action, 3 pages.
28.	Kitsap Public Utility District, October 1997, Kitsap County Initial Basin Assessment, Open File Technical Report Number 97-04, 8 pages excerpted.
29.	Fisher, Cameron, July 26, 2011, Fisheries Biologist, Ecology and Environment, Inc. memorandum to Renee Nordeen, Project Manager, Ecology and Environment, Inc. regarding TDD: 10-11-0007 presence of salmonoid species, 39 pages.
30.	LaBaw, Joanne, July 27, 2011, EPA Region 10, Brownfields Site Manager, telephone conversation with Renee Nordeen, Project Manager, Ecology and Environment, Inc., regarding status of Bremerton Gasworks Targeted Brownfields Assessment, 1, page.
31,	Marcy, Ken, July 27, 2011, EPA Region 10 NPL Coordinator, telephone conversation with Renee Nordeen, Project Manager, Ecology and Environment, Inc., regarding Bremerton Gasworks NPL status, 1 page.
32.	Turcotte, Carol M., October 18, 2010, Washington State Department of Fish and Wildlife, Public Disclosure Officer, electronic mail to Renee Nordeen, Project Manager, Ecology and Environment, inc., regarding commercial fish catch data request, 7 pages.
33.	Washington State Department of Fish and Wildlife, March 1991, Southern Puget Sound Region Aquaculture Management and Catch Reporting Areas map, 1 page.
34.	Washington State Department of Fish and Wildlife, October 31, 2008, Marine Fish-Shellfish Management and catch reporting Areas within Puget Sound (WAC 220-22-400), 1 page.
35.	Richard Brooks, July 27, 2011, The Suquamish Tribe, Environmental Program Manager, letter to Linda Costello, Ecology and Environment, Inc., regarding Bremerton Gasworks Site tribal fish usage, 2 pages.
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Environmental Protection Agency Region 10, regarding Bremerton Gasworks activity, 3 pages.
37. U.S. Environmental Protection Agency, January 2008, Polycyclic Aromatic Hydrocarbons (PAHs), 3 pages.
38. Environmental Data Resources, Inc., February 20, 2012, Certified Sanborn Map Report, 1725 Pennsylvania Avenue, 5 pages.

BREMERTON GASWORKS SUMMARY:

Bremerton Gasworks is the location of the former Bremerton manufactured gas plant (MGP) in Bremerton, Washington (Ref. 4. p. 5). The former Bremerton MGP was located on the south shore of Port Washington Narrows (Ref. 4, p. 5). The MGP produced gas for lighting and heating through the carbureted water gas process from approximately 1931 to 1947 (Ref. 6, p. 40); and through blending propane and air from the mid-1950s to 1963 (Ref. 4, p. 5). The MGP structures were removed between 1963 and the early 1970s (Ref. 4, p. 5).

The former Bremerton MGP was located on a property that included portions of three existing tax parcels: the "North McConkey Property," the "South McConkey Property," and the "Sesko Property" (Ref. 21, p. 6). The real property occupied by the former MGP is referred to as the "Former Bremerton Gasworks Property." The boundaries of the Former Bremerton Gasworks Property and other site features are provided on Figure 1. The historical coal gasification plant included approximately 17 petroleum above ground storage tanks (ASTs), which have since been removed (Ref. 21, pp. 6 and 7). After the MGP was dismantled, the McConkey and Sesko properties were used for industrial purposes including metal fabrication, concrete forming, and boat repair (Ref. 4, p. 5). A petroleum bulk storage and distribution plant formerly was located on a portion of the Sesko Property from about the 1920s to the 1980s, which is west of the Former Bremerton Gasworks Property (Ref. 21, p. 7). The South McConkey property currently includes businesses for self-storage, metal fabrication, and office space, among others (Ref. 18, pp 17 and 18). The majority of the Former Bremerton Gasworks Property is vacant and unused (Ref. 4, pp. 5 and 6).

On August 20, 2010, intermittent sheens were observed on the surface water of Port Washington Narrows near the former MGP (Ref. 4, p. 7). Further investigation identified a 12-inch concrete pipe in the intertidal area that appeared to be discharging product (Ref. 4, pp. 7 and 25). The pipe was determined to be releasing a substance with characteristics similar to coal tar waste from the MGP into the mid-intertidal zone of a navigable waterway (Ref. 4, p. 256).

EPA has sampled sediments adjacent to Bremerton Gasworks on two separate occasions: once during a Targeted Brownfields Assessment (TBA) conducted in 2008 (Ref. 7, p. 16) and once during an Emergency Removal Action (ERA) in October 2010 (Ref. 5, p. 1). The TBA field work was conducted in May and June 2008 (Ref. 7, p. 16). During the TBA, five sediment samples were collected from Port Washington Narrows (Ref. 7, pp. 23 and 24). The EPA ERA field sampling event was conducted on October 9 and 10, 2010. During the October 2010 EPA ERA, a total of 31 sediment samples were collected from Port Washington Narrows (Ref. 5, p. 1). No further investigation will be completed under the Brownfields program (Ref. 30, p. 1). Additionally, it was determined that the extent and complexity of contamination at Bremerton Gasworks was too extensive to handle within either the Brownfields program or the CERCLA removal program; therefore, Bremerton Gasworks is being proposed for listing on the NPL (Ref. 31, p. 1).

In November 2010, an Incident Action and Time Critical Removal Action (RA) was carried out. (Ref. 4, p. 1, 8, 256). During this removal action, two samples of material in the pipe were collected on November 6, 2010 (Ref. 4, pp. 13, 14, and 362).

The source scored for this HRS documentation record is the Concrete Pipe Outfall (Source 1). An observed release of a coal tar-like substance to the marine waters of Port Washington Narrows has been identified. In relation to targets in the surface water migration pathway, it has been documented that a fishery and critical habitats for Federal-listed threatened species are present within the zone of actual contamination (see section 4.1.4.3.1.2).

The ground water-to-surface water component of the surface water migration pathway was not scored because the overland flow/flood component of the surface water migration pathway generated a higher score. However, the ground water-to-surface water component of the surface water migration pathway is of concern since it is known that contaminated ground water underlying Bremerton Gasworks property is present (Ref. 7, pp. 21-23, 79-80). This contaminated ground water may be impacting adjacent surface water features. The average annual precipitation near Bremerton Gasworks of 45.11 inches per year recharges the ground water with fresh water (Ref. 19, p. 1; Ref. 28, p. 5-1). A total of two wells (MP04 and SP02) were installed as part of the 2008 TBA (Ref. 7, pp. 21 and 22). Additionally, samples were collected from borehole locations (MP01GW, MP03GW, SP01GW, and SP03GW) (Ref. 7, pp. 21-22, 79,-80). All ground water samples were analyzed for semivolatile organic compounds (SVOCs), Target Analyte List (TAL) Metals, Total Petroleum Hydrocarbons (TPH) as diesel, and Volatile Organic Compounds (VOCs) (Ref. 7, pp. 17-18, 79-80; Ref 24, pp. 4, 8, 10, 9, 11, 13, 14, 16, 17, 18, 20, 22, and 25). Ground water sample results from the North Bremerton Gasworks Property indicated the presence of four TAL metals and three VOCs at concentrations that exceeded their analyte-specific regulatory screening criteria (Ref. 7, pp. 22, 79-80; Ref. 26, p. 1). Ground water sample results from the South Bremerton Gasworks Property indicated the presence of four TAL metals, seven SVOCs, two VOCs, and diesel range organics at concentrations that exceeded their analyte-specific regulatory screening criteria (Ref. 7, pp. 22-23, 79-80; Ref. 26, p. 1). While the ground water data results presented above demonstrates the presence of contamination in the ground water underlying Bremerton Gasworks property, this data was not used for the purposes of HRS scoring.

Ecology & Environment, Inc. GIS Department R:\3 START 3\Bremerton Gasworks NPL\Bremerton Gasworks\GIS\figure_1_sample_locations.mxd Date: 2/23/2012

ERA Sediment Sample Locations
TBA Sediment Sample Locations
12-inch Concrete Pipe
City of Bremerton Storm Water Outfall
Approximate Cover of Organo-Clay Mat
Average High Water Mark
Former Features
Former MGP Property Boundary
Property Boundary

BREMERTON GASWORKS MAP

Figure 1

0 25 50 100 150
Feet

SOURCE DESCRIPTION

2.2 SOURCE CHARACTERIZATION

Number of the Source: 1

Name and description of the source: Concrete Pipe Outfall (Other)
On August 20, 2010, the Kitsap County Health District (KCHD) observed intermittent sheens on the surface water of Port Washington Narrows near the former MGP (Ref. 4, p. 7). Further investigation by KCHD on October 4, 2010, identified a 12-inch concrete pipe in the intertidal area that appeared to be discharging product to the marine waters of Port Washington Narrows (Ref. 4, pp. 7 and 25). KCHD reported the finding to the EPA (Ref. 4, p. 7). The EPA relayed the finding to the United States Coast Guard (USGC), since the pipe was within the USCG's area of responsibility (Ref. 4, p. 7).

The USCG mobilized to the area on October 6, 2010 and took immediate action to contain the sheen by installing a containment system as of October 10, 2010 (Ref. 4, p. 7). On October 16, 2010, the USCG commenced activities to mitigate the apparent discharge from the pipe by breaking off a 4-foot section of the pipe with a hydraulic hammer, plugging the pipe-end, and placing hydraulic cement over the temporary plug (Ref. 4, p. 7).

The pipe was determined to be releasing a substance with characteristics similar to coal tar into the mid-intertidal zone of a navigable waterway (Ref. 4, p. 256, Ref. 12, p. 67). The sample results indicated the primary constituents detected in all samples were polycyclic aromatic hydrocarbons (PAHs) with lesser amounts of lighter aromatic hydrocarbons such as benzene, toluene, ethylbenzene, and xylenes (BTEX). The major byproduct from the production of carbureted water gas is tar from the uncracked portion of the liquid hydrocarbons fed to the carburetor (Ref. 12, p. 67). These tars contain many of the compounds that are present in coal tar and are very similar to oil-gas tars (Ref. 12, pp. 67 and 145). Oil-gas tars are principally composed of aromatic hydrocarbons; benzene, toluene, naphthalene, phenanthrene, and methyl anthracene (Ref. 12, p. 145). Coal tars principally contain aromatic hydrocarbons: benzene, naphthalene, anthracene, and related compounds (Ref. 12, p. 145). Coal tars also contain phenolics and tar bases which water-gas tars lack (Ref. 12, p. 145). The amount of water-gas tars produced during the manufacture of carbureted water gas have been documented to range from 50 to 1,000 gallons per 1×10^8 cubic feet of gas produced (Ref. 12, p. 155). Tars generated from gas manufacture contain high concentrations of carcinogenic compounds, such as PAHs (Ref. 12, p. 227).

In an effort to identify the origin of the pipe, maps and diagrams of the former MGP and City of Bremerton sewer and storm water records were reviewed (Ref. 4, p. 10). The maps and diagrams showed the pipe was likely an abandoned storm drain or combined sewer outfall that was once connected to or may still be connected to an abandoned vault on the South Bremerton Gasworks Property (Ref. 4, p. 10; Ref. 26, p 1). It was determined that the vault was likely connected by a separate pipe or pipes to one or more former catch basins within the footprint of the former MGP (Ref. 4, p. 10). On November 5, 2010 and November 6, 2010, sediments around the leaking pipe and approximately 60 lineal feet of pipe were removed (Ref. 4, pp. 11 – 14).

In November 2010, an Incident Action and Time Critical Removal Action (RA) was carried out in response to releases from the pipe (Ref. 4, pp. 1, 8, 256). During this removal action, two samples of material in the pipe were collected on November 6, 2010: sample PIPE-40-110610 and PIPE-80-110610 (Ref. 4, pp. 13, 14, and 362). Material in the pipe is shown in a photograph taken during the removal action (Ref. 4, p. 282). The samples were analyzed for TPH as gasoline using method NWTPH-Gx, TPH as diesel and motor oil using method NWTPH-Dx, total metals by EPA Method 200.8, total mercury using EPA Method 1631.E, VOCs using EPA Method 8260C, and SVOCs using EPA Method 8270D (Ref. 4, pp. 321, 322, 323, 324, 326, 328, 329, 331, 332, 336, and 338). Analytical results from these samples indicate the presence of gasoline-range petroleum hydrocarbons, diesel-range petroleum hydrocarbons, motor oil-range petroleum hydrocarbons, metals, VOCs, and SVOCs including PAHs (Ref. 4, pp. 321, 322, 323, 324, 326, 328, 329, 331, 332, 336, and 338; Ref. 37, p. 1). Samples were collected under chain-of-custody procedures (Ref. 4, p. 362).

As a component of the November 2010 RA, the concrete pipe was plugged as close as practicable to the shoreline, all portions of the pipe from this new plug to the pipe terminus were removed, the resulting pipe excavation was backfilled with clean beach material, and an Organo-Clay mat was placed over impacted sediments near the terminus of the pipe (Ref. 4, p. 8).

<u>Location of the source, with reference to a map:</u>
Prior to the removal action, the concrete pipe outfall was located in the intertidal zone of Port Washington Narrows. The plugged end of the concrete pipe is located just north of the Sesko property. (Ref. 4, pp. 7, 8, 10, and 27; Ref. 26, p. 1).

<u>Containment</u>
Release to Surface Water via Overland Migration and/or Flood: A surface water containment factor value of 10 is assigned because the pipe's discharge of waste directly to the marine waters of Port Washington Narrows is evidence of hazardous substance migration from the source area (Ref. 1, p. 51609, Table 4-2; Ref. 4, pp. 7, 282, and 296).

Containment Value: 10

2.2.2 HAZARDOUS SUBSTANCES ASSOCIATED WITH THE SOURCE

November 2010 Removal Action (Ref. 4):

- Source Samples: Two samples were collected of material from the concrete pipe as presented in Table 1 below:

Table 1
November 2010 Removal Action

Sample ID	Matrix[1]	Date	Hazardous Substance	Hazardous Substance Concentration	Sample Quantitation Limit[a]	Reference
PIPE-40-110610	Soil	11/6/10	2-Methylnaphthalene	0.82 mg/kg	0.3 mg/kg	Ref. 4, pp. 328, 336, 362; Ref. 27, pp. 2 and 3
			Acenaphthene	0.50 mg/kg	0.3 mg/kg	
			Anthracene	0.65 mg/kg	0.3 mg/kg	
			Benz(a)anthracene	1.7 mg/kg	0.3 mg/kg	
			Benzo(a)pyrene	2.1 mg/kg	0.3 mg/kg	
			Benzo(b)fluoranthene	2.1 mg/kg	0.3 mg/kg	
			Benzo(g,h,i)perylene	1.9 mg/kg	0.3 mg/kg	
			Benzo(k)fluoranthene	0.76 mg/kg	0.3 mg/kg	
			Chrysene	1.6 mg/kg	0.3 mg/kg	
			Dibenz(a,h)anthracene	0.30 mg/kg	0.3 mg/kg	
			Fluoranthene	3.7 mg/kg	0.3 mg/kg	
			Fluorene	0.40 mg/kg	0.3 mg/kg	
			Naphthalene	57 mg/kg	0.5 mg/kg	
			Phenanthrene	1.7 mg/kg	0.3 mg/kg	
			Pyrene	5.4 mg/kg	0.3 mg/kg	
PIPE-80-110610	Soil	11/6/10	2-Methylnaphthalene	300 mg/kg	6 mg/kg	Ref. 4, Part 4, pp. 324, 326, 332, 338, and 362; Ref. 27, pp. 2 and 3
			Acenaphthene	88 mg/kg	6 mg/kg	
			Anthracene	130 mg/kg	6 mg/kg	
			Benz(a)anthracene	120 mg/kg	6 mg/kg	
			Benzo(a)pyrene	110 mg/kg	6 mg/kg	
			Benzo(b)fluoranthene	100 mg/kg	6 mg/kg	
			Benzo(g,h,i)perylene	84 mg/kg	6 mg/kg	
			Benzo(k)fluoranthene	38 mg/kg	6 mg/kg	
			Carbazole	7.9 mg/kg	6 mg/kg	
			Chrysene	130 mg/kg	6 mg/kg	
			Dibenz(a,h)anthracene	13 mg/kg	6 mg/kg	
			Dibenzofuran	18 mg/kg	6 mg/kg	
			Fluoranthene	300 mg/kg	6 mg/kg	
			Fluorene	120 mg/kg	6 mg/kg	
			Naphthalene	320 mg/kg	5 mg/kg	
			Phenanthrene	440 mg/kg	6 mg/kg	
			Pyrene	400 mg/kg	6 mg/kg	

Notes:
a – The sample quantitation limit used meets the definition provided in Ref. 1, p. 51586 (Ref. 27, p. 1).
1 – The matrix of these samples is listed as "soil" on the analytical data forms; however, the sample description is noted as "contents of the section of Pipe" (Ref. 4, pp. 13, 14, 324, 326, 332, and 338).

Table 1 November 2010 Removal Action						
Sample ID	**Matrix[1]**	**Date**	**Hazardous Substance**	**Hazardous Substance Concentration**	**Sample Quantitation Limit[a]**	**Reference**
Key: ID = Identification. mg/kg = milligrams per kilogram.						

List of Hazardous Substances Associated with Source

Naphthalene, 2-Methylnaphthalene, Acenaphthene, Dibenzofuran, Fluorene, Phenanthrene, Anthracene, Carbazole, Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Dibenz(a,h)anthracene, and Benzo(g,h,i)perylene.

2.4.2 Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity

Available data are insufficient to document a hazardous constituent quantity (Ref. 1, p. 51590, Section 2.4.2.1.1).

Hazardous Constituent Quantity Value (S): NS

2.4.2.1.2 Hazardous Wastestream Quantity

The quantity of hazardous substances released is not known. As a conservative estimate, a wastestream quantity of greater than 0 is assigned (Ref. 1, p. 51591, Section 2.4.2.1.2).

Hazardous Wastestream Quantity (W): >0

2.4.2.1.3 Volume

Available data are insufficient to document a volume measure (Ref. 1, p. 51591, Section 2.4.2.1.3).

Volume Assigned Value (V): 0

2.4.2.1.4 Area

Available data are insufficient to document an area measure (Ref. 1, p. 51591, Section 2.4.2.1.4.

Area Assigned Value (A): 0

Source Hazardous Waste Quantity Factor Value (Ref. 1, p. 51591): >0

Table 2 Summary of Source Descriptions			
Source Number	**Source Hazardous Waste Quantity Value [a]**	**Source Hazardous Constituent Quantity Complete? (Y/N)**	**Containment Value for Surface Water [b]**
1. Concrete Pipe Outfall	>0	N	10
[a] - See Section 2.4.2 of this document. [b] - See Section 2.2 of this document; Ref. 1, pp. 51609, 51610, and Table 4-2.			

Other Possible Sources
Contaminated subsurface soil is present at the Bremerton Gasworks property as demonstrated by analytical results of samples collected during the 2008 TBA. During this field event, four borehole locations (MP01 through MP04) and one monitoring well (MP04) were installed (Ref. 7, p. 21; Ref. 26, p. 1). Locations MP01 and MP04 were on the North McConkey Property while locations MP02 and MP03 were west of this property (Ref. 7, pp. 24 and 25). Subsurface soil samples were collected at 5-foot intervals from ground surface to a total maximum depth of 40 feet bgs (Ref. 7, p. 21). A total of 23 soil samples were collected from these boreholes (Ref. 7, p. 21, Ref. 26, p. 1). A total of seven SVOCs were detected in subsurface soil samples at concentrations that exceeded their analyte-specific regulatory screening criteria values (Ref. 7, p. 22). These SVOCs were benz(a)anthracene, benzo(a)pyrene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, and naphthalene (Ref. 7, p. 64).

Three borehole locations (SP01 through SP03) were installed on the South Bremerton Gasworks Property during the 2008 TBA (Ref. 7, p. 22; Ref. 26, p. 1). Soil samples were collected at 5-foot intervals from ground surface to a total maximum depth of 45 feet bgs (Ref. 7, p. 22). A total of 19 soil samples were collected at the South Bremerton Gasworks Property (Ref. 7, p. 22; Ref. 26, p. 1). Soil sample results indicated the presence of arsenic and thallium, nine SVOCs [benz(a)anthracene, benzo(a)pyrene equivalents, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and naphthalene], three VOCs (benzene, ethylbenzene, and toluene), diesel range organics, and oil & grease at concentrations that exceeded the regulatory screening criteria at borehole SP03 (Ref. 7, pp. 22, 64, 65, 66, 67, and 68).

Contaminated subsurface soil is not included as a source in this HRS documentation record since an overland route from it to the surface water migration pathway has not been adequately documented. Contaminated subsurface soil also has not been included in this HRS documentation record, since the ground water-to-surface water component of the surface water migration pathway is not being scored.

4.1 OVERLAND/FLOOD MIGRATION COMPONENT

4.1.1 GENERAL CONSIDERATIONS

4.1.1.1 Definition of Hazardous Substance Migration Path for Overland/Flood Component

A 12-inch concrete pipe in the intertidal area was discharging product to the marine waters of Port Washington Narrows (Ref. 4, pp. 7 and 25). The pipe was likely an abandoned storm drain or combined sewer outfall that was once connected to or may still be connected to an abandoned vault on the South Bremerton Gasworks Property (Ref. 4, p. 10; Ref. 26, p. 1). Photographs of the staked pipe location demonstrate that it extended into the water (Ref. 4, p. 296). Visible black oily contamination at the beach surface appeared to cover approximately 100 square feet of visible beach surface, starting approximately 60 feet below the high tide mark (Ref. 13, p. 2). Visible contamination extended to an unknown depth of soil (but at least two feet below ground surface in places) and continued out into the water below the low tide line (Ref. 13, p. 2).

The Puget Sound is used for fishing within the TDL (Ref. 20, p. 3; Ref. 25, pp. 1, 2). The Puget Sound provides habitat for two Federal-listed threatened salmon species which occur within the zone of actual contamination in the TDL (see Section 4.1.4.3.1.2)

4.1.1.2 Target Distance Limit

The discharge point of the concrete pipe (Source 1) is the probable point of entry (PPE) of hazardous substances to the surface water migration pathway. This pipe was located in the intertidal area and was discharging product to the marine waters of Port Washington Narrows which is a part of Puget Sound (Ref. 4, pp. 7 and 25; Ref. 18, p. 19). The entire surface water migration pathway 15-mile target distance limit (TDL) is contained in radial arcs within Puget Sound (Ref. 20, p. 3). Puget Sound is a coastal tidal water body and does not have a distinct direction of flow (Ref. 3, p. 1).

4.1.2.1 LIKELIHOOD OF RELEASE

4.1.2.1.1 Observed Release

Direct Observation

Basis for Direct Observation:
On August 20, 2010, the KCHD observed intermittent sheens on the surface water of Port Washington Narrows near the former MGP (Ref. 4, p. 7). Further investigation by KCHD on October 4, 2010, identified a 12-inch concrete pipe in the intertidal area that appeared to be discharging product to the marine waters of Port Washington Narrows (Ref. 4, pp. 7 and 25). The pipe was likely an abandoned storm drain or combined sewer outfall that was once connected to or may still be connected to an abandoned vault on the South Bremerton Gasworks Property (Ref. 4, p. 10; Ref. 26, p. 1). Photographs of the staked pipe location demonstrate that it extended into the water (Ref. 4, p. 296). Material in the pipe is also depicted in a photograph and appears as a black substance (Ref. 4, p. 282). Visible black oily contamination at the beach surface appeared to cover approximately 100 square feet of visible beach surface, starting approximately 60 feet below the high tide mark (Ref. 13, p. 2). Visible contamination extended to an unknown depth of soil (but at least two feet below ground surface in places) and continued out into the water below the low tide line (Ref. 13, p. 2). Two samples of the material in the concrete pipe contained several hazardous substances including naphthalene, 2-methylnaphthalene, acenaphthene, anthracene, benz(a)anthracene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, benzo(a)pyrene, carbazole, chrysene, dibenz(a,h)anthracene, dibenzofuran, fluorene, fluoranthene, phenanthrene, and pyrene (see Section 2.2, Source 1). Of these, all are PAHs with the exception of naphthalene, 2-methylnaphthalene, carbazole, and dibenzofuran, (Ref. 37, p. 1). PAHs are known to be present in the waste associated with the carbureted water gas process, which has characteristics similar to coal tar. (Ref. 12, pp. 67, 145 and 227). The majority of these same hazardous substances were also detected in sediments near the pipe (see chemical analysis tables below).

Chemical Analysis:

Basis for Chemical Analysis:
Sediment samples collected from Port Washington Narrows during two recent sampling events will be used to document an observed release by chemical analysis as presented below.

October 2010 EPA Emergency Removal Action (Ref. 5)
During the October 2010 EPA ERA, sediment samples were collected around the exposed concrete pipe (i.e., Source 1) (Ref. 5, p. 1). The samples collected to document an observed release were generally collected outside of the removal area (see Figure 1). Samples were collected during the October 2010 EPA ERA from the sediment around the pipe on October 9, 2010 and October 10, 2010 (Ref. 5, p. 1). The samples were placed on ice and stored in coolers that were continuously maintained under chain-of-custody (Ref. 5, pp. 2, and 4 through 8). The samples were submitted for off-site fixed laboratory analysis of SVOCs using EPA Method 8260 and VOCs using EPA Method 8270 (Ref. 5, pp. 2, 10, and 33). No background samples were collected in conjunction with this ERA (Ref. 5, p. 1). Rocks and other debris were removed as much as possible from the sample material before it was placed into sample containers (Ref. 5, p. 2). Collected material was homogenized thoroughly in dedicated stainless steel bowls and placed into pre-labeled sample containers (Ref. 5, p. 2). The VOCs aliquots were removed directly from the sampling locations using 5-gram Core-N-One ™ samplers prior to homogenization (Ref. 5, p. 2). A Stage 2B manual validation was performed on all data and a Stage 4 manual validation of 10% of the data was conducted (Ref. 9, p. 1).

Because no background samples were collected during the October 2010 EPA ERA, three sediment samples (GL03E03, GL04E03, and GL04E04), were selected for comparison to release samples since they contained significantly less contamination than the other sediment samples (as shown in Table 3 below), they were composed of similar materials as the other sediment samples, and they were collected below the average high tide line (Ref. 5, pp 1, 2, and 3; Ref. 10). Although these samples may be affected by the release, they are used as background samples as a conservative approach and the release samples still meet the HRS criteria for establishing an observed release (Ref. 1, p.51589) All sediment samples consisted of dark brown-grayish, very fine to course grained sandy material (Ref. 5, p. 2). Table 3 below provides analytical results of the designated background samples. Either the highest concentration, or the highest detection limit if a particular analyte was not detected in the background samples, for each analyte between these samples was selected to represent background conditions for this HRS documentation record. Using this approach, 11 hazardous substances are documented to be present at elevated concentrations in the sediments of Port Washington Narrows: anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, phenanthrene, and pyrene as demonstrated in Table 3 below (see Table 3 for references). For these compounds, the highest background concentration selected per analyte by sample are: sample GL04E03 for anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, phenanthrene, and pyrene; sample GL03E03 for benzo(b)fluoranthene; and sample GL04E04 for fluoranthene.

Table 3 October 2010 EPA Emergency Removal Action Sediment Samples						
Sample ID	**Distance from PPE**	**Sample Date**	**Hazardous Substance**	**Concentration (mg/kg)**	**Sample Quantitation Limit (mg/kg)[a]**	**Reference**
GL03E03 – Background Sample	85 feet	10/09/2010	Anthracene	0.3 U	0.3	Ref. 5, pp. 4 and 41; Ref. 9, p. 2; Ref. 20, p. 2
			Benz(a)anthracene	0.3 U	0.3	
			Benzo(a)pyrene	0.3 U	0.3	
			Benzo(b)fluoranthene	0.31 JK AC = 3.1	0.3	
			Benzo(g,h,i)perylene	0.3 U	0.3	
			Benzo(k)fluoranthene	0.3 U	0.3	
			Chrysene	0.3 U	0.3	
			Fluoranthene	0.34	0.3	
			Phenanthrene	0.3 U	0.3	
			Pyrene	0.53	0.3	
GL04E03 – Background Sample	69 feet	10/10/2010	Anthracene	3 U	3	Ref. 5, pp. 6 and 50; Ref. 9, p. 2; Ref. 20, p. 2
			Benz(a)anthracene	3 U	3	
			Benzo(a)pyrene	3 U	3	
			Benzo(b)fluoranthene	3 U	3	
			Benzo(g,h,i)perylene	3 U	3	
			Benzo(k)fluoranthene	3 U	3	
			Chrysene	3 U	3	
			Fluoranthene	3 U	3	
			Phenanthrene	3 U	3	
			Pyrene	4.5	3	
GL04E04 – Background Sample	84 feet	10/10/2010	Anthracene	1.5 U	1.5	Ref. 5, pp. 6 and 51; Ref. 9, p. 2; Ref. 20, p. 2
			Benz(a)anthracene	1.5 U	1.5	
			Benzo(a)pyrene	1.5 U	1.5	
			Benzo(b)fluoranthene	1.5 U	1.5	
			Benzo(g,h,i)perylene	1.5 U	1.5	
			Benzo(k)fluoranthene	1.5 U	1.5	
			Chrysene	1.5 U	1.5	
			Fluoranthene	1.5	1.5	
			Phenanthrene	1.5 U	1.5	
			Pyrene	2.2	1.5	

Table 3 October 2010 EPA Emergency Removal Action Sediment Samples						
Sample ID	**Distance from PPE**	**Sample Date**	**Hazardous Substance**	**Concentration (mg/kg)**	**Sample Quantitation Limit (mg/kg)[a]**	**Reference**
GL03E01	65 feet	10/10/2010	Benz(a)anthracene	4.4	3	Ref. 5, pp. 5 and 44; Ref. 9, p. 2; Ref. 20, p. 2
			Benzo(a)pyrene	3.9	3	
			Chrysene	4.9	3	
			Fluoranthene	7	3	
			Phenanthrene	3	3	
GL03W01	53 feet	10/10/2010	Benz(a)anthracene	24	15	Ref. 5, pp. 5 and 46; Ref. 9, p. 3; Ref. 20, p. 2
			Benzo(a)pyrene	17	15	
			Chrysene	24	15	
			Fluoranthene	42	15	
			Phenanthrene	18	15	
			Pyrene	72	15	
GL03W02	59 feet	10/10/2010	Benz(a)anthracene	6.6	3	Ref. 5, pp. 5 and 46 and 47; Ref. 9, p. 3; Ref. 20, p. 2
			Benzo(a)pyrene	5.4	3	
			Benzo(g,h,i)perylene	4	3	
			Chrysene	4.4	3	
			Fluoranthene	8.3	3	
			Phenanthrene	3.3	3	
			Pyrene	15	3	
GL04E01	37 feet	10/10/2010	Benz(a)anthracene	9.4	3	Ref. 5, pp.5 and 48; Ref. 9, p. 3; Ref. 20, p. 2
			Benzo(a)pyrene	7.6	3	
			Benzo(g,h,i)perylene	6.1	3	
			Chrysene	6.9	3	
			Fluoranthene	14	3	
			Phenanthrene	5.3	3	
			Pyrene	25	3	
GL04E02	54 feet	10/10/2010	Benz(a)anthracene	8.1	3	Ref. 5, pp. 5, 6, and 49; Ref. 9, p. 3; Ref. 20, p. 2
			Benzo(a)pyrene	6.6	3	
			Benzo(g,h,i)perylene	5.3	3	
			Chrysene	5.8	3	
			Fluoranthene	10	3	
			Pyrene	19	3	

Table 3 October 2010 EPA Emergency Removal Action Sediment Samples						
Sample ID	**Distance from PPE**	**Sample Date**	**Hazardous Substance**	**Concentration (mg/kg)**	**Sample Quantitation Limit (mg/kg)[a]**	**Reference**
GL04W01	35 feet	10/10/2010	Benz(a)anthracene	9.6	3	Ref. 5, pp. 6 and 52; Ref. 9, p. 3; Ref. 20, p. 2
			Benzo(a)pyrene	9.6	3	
			Benzo(g,h,i)perylene	7.1	3	
			Chrysene	9.8	3	
			Fluoranthene	15	3	
			Phenanthrene	4.7	3	
			Pyrene	26	3	
GL04W02	44 feet	10/10/2010	Benz(a)anthracene	16	15	Ref. 5, pp. 6 and 53; Ref. 9, p. 3; Ref. 20, p. 2
			Chrysene	16	15	
			Fluoranthene	26	15	
			Pyrene	40	15	
GL04W03	57 feet	10/10/2010	Benz(a)anthracene	9.7	3	Ref. 5, pp. 6 and 54; Ref. 9, p. 3-4; Ref. 20, p. 2
			Benzo(a)pyrene	8.1	3	
			Benzo(g,h,i)perylene	6.5	3	
			Benzo(k)fluoranthene	3.1	3	
			Chrysene	10	3	
			Fluoranthene	18	3	
			Phenanthrene	6	3	
			Pyrene	30	3	
GL05E01	41 feet	10/10/2010	Benz(a)anthracene	3.3	3	Ref. 5, pp. 6 and 55 and 56; Ref. 9, p. 4; Ref. 20, p. 2
			Chrysene	3.3	3	
			Fluoranthene	4.7	3	
GL05E02	58 feet	10/10/2010	Benz(a)anthracene	11	3	Ref. 5, pp. 6, 7, and 56; Ref. 9, p. 4; Ref. 20, p. 2
			Benzo(a)pyrene	9.6	3	
			Benzo(g,h,i)perylene	5.7	3	
			Benzo(k)fluoranthene	3.1	3	
			Chrysene	11	3	
			Fluoranthene	19	3	
			Phenanthrene	6.9	3	
			Pyrene	34	3	

Table 3 October 2010 EPA Emergency Removal Action Sediment Samples						
Sample ID	**Distance from PPE**	**Sample Date**	**Hazardous Substance**	**Concentration (mg/kg)**	**Sample Quantitation Limit (mg/kg)[a]**	**Reference**
GL05E03	77 feet	10/10/2010	Benz(a)anthracene	4.4	3	Ref. 5, pp. 7 and 57; Ref. 9, p. 4p; Ref. 20, p. 2
			Benzo(a)pyrene	5	3	
			Benzo(g,h,i)perylene	5.4	3	
			Chrysene	5.6	3	
			Fluoranthene	6	3	
GL05W01	24 feet	10/10/2010	Anthracene	4.5	3	Ref. 5, pp. 7 and 58; Ref. 9, p. 4; Ref. 20, p. 2
			Benz(a)anthracene	16	3	
			Benzo(a)pyrene	14	3	
			Benzo(g,h,i)perylene	11	3	
			Benzo(k)fluoranthene	5.7	3	
			Chrysene	16	3	
			Fluoranthene	29	3	
			Phenanthrene	17	3	
			Pyrene	50	3	
GL05W02	36 feet	10/10/2010	Benz(a)anthracene	6.7	3	Ref. 5, pp. 7 and 59; Ref. 9, p. 4; Ref. 20, p. 2
			Benzo(a)pyrene	6	3	
			Benzo(g,h,i)perylene	5.1	3	
			Chrysene	6.8	3	
			Fluoranthene	9.8	3	
			Phenanthrene	4.2	3	
			Pyrene	16	3	
GL05W03	55 feet	10/10/2010	Benz(a)anthracene	19	15	Ref. 5, pp. 7 and 59 and 60; Ref. 9, p. 4; Ref. 20, p. 2
			Benzo(a)pyrene	17	15	
			Chrysene	20	15	
			Fluoranthene	35	15	
			Pyrene	51	15	
GL06E01	36 feet	10/10/2010	Benz(a)anthracene	4.3	3	Ref. 5, pp. 7 and 61; Ref. 9, p. 5; Ref. 20, p. 2
			Benzo(a)pyrene	3.5	3	
			Chrysene	4.2	3	
			Fluoranthene	7.6	3	

Table 3 October 2010 EPA Emergency Removal Action Sediment Samples						
Sample ID	**Distance from PPE**	**Sample Date**	**Hazardous Substance**	**Concentration (mg/kg)**	**Sample Quantitation Limit (mg/kg)[a]**	**Reference**
GL06E02	55 feet	10/10/2010	Benz(a)anthracene	7.6	3	Ref. 5, pp 7 and. 62; Ref. 9, p. 5; Ref. 20, p. 2
			Benzo(a)pyrene	7.1	3	
			Benzo(g,h,i)perylene	5.3	3	
			Chrysene	7.8	3	
			Fluoranthene	12	3	
			Phenanthrene	7.6	3	
			Pyrene	20	3	
GL06E03	76 feet	10/10/2010	Benzo(a)pyrene	3.1	3	Ref. 5, pp. 7 and 63; Ref. 9, p. 5; Ref. 20, p. 2
			Chrysene	3.6	3	
GL06W01	16 feet	10/10/2010	Benz(a)anthracene	3.5	3	Ref. 5, pp. 8 and 64; Ref. 9, p. 5; Ref. 20, p. 2
			Benzo(a)pyrene	3.2	3	
			Chrysene	3.3	3	
			Fluoranthene	4.5	3	
GL06W02	37 feet	10/10/2010	Fluoranthene	16	15	Ref. 5, pp. 8 and 65; Ref. 9, p. 5; Ref. 20, p. 2
			Pyrene	28	15	
GL06W03	56 feet	10/10/2010	Benz(a)anthracene	69	15	Ref. 5, pp. 8 and 66; Ref. 9, p. 5; Ref. 20, p. 2
			Benzo(a)pyrene	76	15	
			Benzo(b)fluoranthene	110 JK AC = 11.0	15	
			Benzo(g,h,i)perylene	60	15	
			Benzo(k)fluoranthene	32	15	
			Chrysene	80	15	
			Fluoranthene	110	15	
			Phenanthrene	36	15	
			Pyrene	160	15	

Note:

a – The sample quantitation limit used meets the definition provided in Ref. 1, p. 51586. Also, Ref. 9 lists SQLs in micrograms per kilogram (µg/kg) units; these have been converted to mg/kg to facilitate comparison to detected concentrations (1 mg/kg = 1,000 µg/kg).

Key:

AC = Adjusted concentration as per Ref. 16, pp. 8 and 14

mg/kg = milligrams per kilogram.

K = Unknown bias (Ref. 5, p. 35).

J	=	The associated numerical value in an estimated quantity because the reported concentrations were less than the sample quantitation limits or because quality control criteria limits were not met. (Ref. 5, p. 35)
U	=	The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit (Ref. 5, p. 35).

2008 EPA Targeted Brownfields Assessment (Ref. 7)
During the 2008 TBA sampling event which was conducted from May 12, 2008 to May 15, 2008, on May 19, 2008 and June 4, 2008, five sediment samples (WN01SD through WN05SD) were collected from the sediments along Port Washington Narrows (Ref. 7, p. 23, 24, and 42). The samples were collected during low tide and below the average high water mark using a dedicated stainless steel split-spoon hand augur drilled to a depth of 30 centimeters below ground surface (Ref. 7, p. 23; Ref. 10, p. 1). Product seeps were noted near sample locations WN01SD, WN02SD, and WN03SD (Ref. 7, p. 23). The samples were stored in coolers on ice and maintained under chain-of-custody (Ref. 17, p. 21; Ref. 24, pp. 1 through 3). Sampling for the 2008 TBA was conducted in accordance with an EPA-approved Sampling and Quality Assurance Plan (SQAP) (Ref. 7, p. 16; Ref. 8, p. 33). Sample material was placed in dedicated stainless steel bowls, thoroughly homogenized, and placed into pre-labeled sample containers (Ref. 8, p. 16 and 33). The VOC aliquot was removed directly from the sampler prior to homogenization (Ref. 8, p. 16 and 33). The sediment samples were submitted to off-site fixed laboratories for analysis of TAL metals (EPA CLP SOW ILM05.4), SVOCs (EPA CLP SOW SOM01.2), and VOCs (EPA CLP SOW SOM01.2) (Ref. 7, pp.390 and 502; Ref. 24, pp. 1 through 3). All data underwent data validation (Ref. 7, pp. 17 and 100). Analytical results were validated by EPA chemists and in most cases were reviewed by an E & E chemist (Ref. 7, pp 390 through 396 and 502 through 596).

A designated background sediment sample was not collected during the 2008 TBA. Sediment sample WN05SD is selected for comparison to release samples because it exhibited the least amount of contamination (as shown in Table 4 below), is furthest from the Source 1, and was collected from a similar substrate as other 2008 TBA sediment samples as evidenced by photographs of the these samples and their locations (Ref. 7, pp. 24, and 49 – 54). Additionally, all samples were collected on the same date, during the same tide cycle, and on the same beach (Ref. 7, pp. 49 – 54; Ref. 17, p. 21). Although this sample may be affected by the release, it is used as a background sample as a conservative approach and the observed release samples still meet the HRS criteria for establishing an observed release (Ref. 1, p.51589)

Table 4 below provides information about the designated background sediment sample concentrations and hazardous substances present in the Port Washington Narrows sediment samples collected during the 2008 TBA.

Table 4
2008 EPA TBA Sediment Samples

Sample ID	Distance from PPE	Sample Date	Hazardous Substance	Concentration	Adjusted CRQL	Reference
WN05SD – Background (J8K78; MJ8J78; 08204462)	306 feet	6/4/2008	2-Methylnaphthalene	24 U µg/kg	24 µg/kg	Ref. 7, pp. 589-590, 593; Ref. 14, p. 2; Ref. 17 p. 21; Ref. 20, p. 2; Ref. 24, p. 1
			Acenaphthene	24 U µg/kg	24 µg/kg	
			Anthracene	34 µg/kg	24 µg/kg	
			Benz(a)anthracene	160 µg/kg	24 µg/kg	
			Benzo(a)pyrene	260 µg/kg	24 µg/kg	
			Benzo(b)fluoranthene	130 µg/kg	24 µg/kg	
			Benzo(g,h,i)perylene	190 µg/kg	24 µg/kg	
			Benzo(k)fluoranthene	160 µg/kg	24 µg/kg	
			Chrysene	170 µg/kg	24 µg/kg	
			Dibenz(a,h)anthracene	47 µg/kg	24 µg/kg	
			Dibenzofuran	24 U µg/kg	24 µg/kg	
			Fluoranthene	400 µg/kg	97 µg/kg	
			Phenanthrene	140 µg/kg	24 µg/kg	
			Pyrene	500 µg/kg	97 µg/kg	
WN01SD (J8K74; 08204458)	46 feet	6/4/2008	2-Methylnaphthalene	690 µg/kg	240 µg/kg	Ref. 7, pp. 520, 523, 524, and 527; Ref. 14, p. 2; Ref. 17, p. 21; Ref. 20, p. 2; Ref. 24, p. 1
			Acenaphthene	360 µg/kg	24 µg/kg	
			Anthracene	830 µg/kg	240 µg/kg	
			Benz(a)anthracene	3200 µg/kg	240 µg/kg	
			Benzo(a)pyrene	3600 µg/kg	240 µg/kg	
			Benzo(b)fluoranthene	2000 µg/kg	240 µg/kg	
			Benzo(g,h,i)perylene	2100 µg/kg	240 µg/kg	
			Benzo(k)fluoranthene	2200 µg/kg	240 µg/kg	
			Chrysene	3200 µg/kg	240 µg/kg	
			Dibenz(a,h)anthracene	600 µg/kg	240 µg/kg	
			Dibenzofuran	74 µg/kg	24 µg/kg	
			Fluoranthene	6600 µg/kg	2400 µg/kg	
			Phenanthrene	2200 µg/kg	240 µg/kg	
			Pyrene	9100 µg/kg	2400 µg/kg	

Table 4 2008 EPA TBA Sediment Samples						
Sample ID	**Distance from PPE**	**Sample Date**	**Hazardous Substance**	**Concentration**	**Adjusted CRQL**	**Reference**
WN02SD (J8K75; 08204459)	87 feet	6/4/2008	2-Methylnaphthalene	390 μg/kg	25 μg/kg	Ref. 7, pp. 535, 539, and 542; Ref. 14, p. 3; Ref. 17, p. 21; Ref. 20, p. 2; Ref. 24, p. 1
			Acenaphthene	73 μg/kg	25 μg/kg	
			Anthracene	1300 μg/kg	130 μg/kg	
			Benz(a)anthracene	3200 μg/kg	1300 μg/kg	
			Benzo(a)pyrene	3700 μg/kg	1300 μg/kg	
			Benzo(b)fluoranthene	2000 μg/kg	1300 μg/kg	
			Benzo(g,h,i)perylene	2700 μg/kg	1300 μg/kg	
			Benzo(k)fluoranthene	2600 μg/kg	1300 μg/kg	
			Chrysene	3500 μg/kg	1300 μg/kg	
			Dibenz(a,h)anthracene	920 μg/kg	130 μg/kg	
			Dibenzofuran	58 μg/kg	25 μg/kg	
			Fluoranthene	6000 μg/kg	1300 μg/kg	
			Phenanthrene	1900 μg/kg	1300 μg/kg	
			Pyrene	7100 μg/kg	1300 μg/kg	
WN03SD (J8K76; MJ8J76; 08204460)	167 feet	6/4/2008	2-Methylnaphthalene	370 μg/kg	260 μg/kg	Ref. 7, pp. 553, 556, 557, and 560; Ref. 14, p. 3; Ref. 17, p. 21; Ref. 20, p. 2; Ref. 24, p. 1
			Acenaphthene	240 μg/kg	97 μg/kg	
			Anthracene	1400 μg/kg	1300 μg/kg	
			Benz(a)anthracene	3000 μg/kg	1300 μg/kg	
			Benzo(a)pyrene	3400 μg/kg	1300 μg/kg	
			Benzo(b)fluoranthene	2400 μg/kg	1300 μg/kg	
			Benzo(g,h,i)perylene	3000 μg/kg	260 μg/kg	
			Benzo(k)fluoranthene	2600 μg/kg	1300 μg/kg	
			Chrysene	3300 μg/kg	1300 μg/kg	
			Dibenz(a,h)anthracene	870 μg/kg	260 μg/kg	
			Dibenzofuran	71 μg/kg	26 μg/kg	
			Fluoranthene	6500 μg/kg	1300 μg/kg	
			Phenanthrene	2900 μg/kg	1300 μg/kg	
			Pyrene	7500 μg/kg	1300 μg/kg	

Table 4 2008 EPA TBA Sediment Samples						
Sample ID	**Distance from PPE**	**Sample Date**	**Hazardous Substance**	**Concentration**	**Adjusted CRQL**	**Reference**
WN04SD (J8K77; 08204461)	266 feet	6/4/2008	2-Methylnaphthalene	210 μg/kg	24 μg/kg	Ref. 7, pp. 502, 571, 575, and 578; Ref. 14, p. 3; Ref. 17 p. 21; Ref. 20, p. 2; Ref. 24, p. 1
			Acenaphthene	97 μg/kg	24 μg/kg	
			Benz(a)anthracene	5600 μg/kg	2400 μg/kg	
			Benzo(a)pyrene	6300 μg/kg	2400 μg/kg	
			Benzo(b)fluoranthene	3400 μg/kg	240 μg/kg	
			Benzo(g,h,i)perylene	3800 μg/kg	240 μg/kg	
			Benzo(k)fluoranthene	3600 μg/kg	240 μg/kg	
			Chrysene	6000 μg/kg	2400 μg/kg	
			Dibenz(a,h)anthracene	860 μg/kg	240 μg/kg	
			Dibenzofuran	69 μg/kg	24 μg/kg	
			Fluoranthene	15000 JL μg/kg	2400 μg/kg	
			Phenanthrene	8100 JL μg/kg	2400 μg/kg	
			Pyrene	18000 μg/kg	2400 μg/kg	

Note:
a – The sample quantitation limit used meets the definition provided in Ref. 1, p. 51586.

Key:
μg/kg = micrograms per kilogram.
mg/kg = milligrams per kilogram.
L = Low bias (Ref. 7, pp. 509-510).
J = The analyte was positively identified. The associated numerical result is an estimate (Ref. 7, p. 513).
U = The analyte was not detected at or above the reported result (Ref. 5, p. 513).
CRQL = Contract Required Quantitation Limit (Ref. 14, p. 1)

Attribution:

Source 1, the 12-inch concrete pipe, was observed to be discharging product to the marine waters of Port Washington Narrows (Ref. 4, pp. 7 and 25). The concrete pipe was discovered after the Kitsap County Health Department received numerous calls regarding sheens on Port Washington Narrows (Ref. 36, p. 1). A county employee went to the area near the site on the beach of Port Washington Narrows and after digging discovered the pipe, which contained an oily smelly substance which resembled coal tar (Ref. 36, pp. 1 and 3). Observed release samples were collected during the June 2008 EPA TBA and October 2010 EPA ERA, and Source 1 pipe contents samples were collected during the November 2010 RA; the analytes detected at elevated concentrations in the beach sediments associated with the 2008 EPA TBA and October 2010 EPA ERA sampling events are the same as those detected in the Source 1 pipe contents samples. The pipe was likely an abandoned storm drain or combined sewer outfall that was once connected to or may still be connected to an abandoned vault on the South Bremerton Gasworks Property (Ref. 4, p. 10; Ref. 26, p. 1). Visible black oily contamination at the beach surface appeared to cover approximately 100 square feet of visible beach surface, starting approximately 60 feet below the high tide mark (Ref. 13, p. 2). Visible contamination extended to an unknown depth of soil (but at least two feet below ground surface in places) and continued out into the water below the low tide line (Ref. 13, p. 2). Two samples of the material in the concrete pipe contained several hazardous substances including naphthalene, 2-methylnaphthalene, acenaphthene, anthracene, benz(a)anthracene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, benzo(a)pyrene, carbazole, chrysene, dibenz(a,h)anthracene, dibenzofuran, fluorene, fluoranthene, phenanthrene, and pyrene (see Section 2.2, Source 1). Of these, all are PAHs with the exception of naphthalene, 2-methylnaphthalene, carbazole, and dibenzofuran, (Ref. 37, p. 1). PAHs are known to be present in the waste associated with the carbureted water gas process, which has characteristics similar to coal tar. (Ref. 12, pp. 67, 145 and 227).

The product discharging from the concrete pipe was described as having characteristics similar to coal tar (Ref. 4, p. 256; Ref. 12, p. 67), but was more likely water-gas tar, a major byproduct from the production of carbureted water gas (Ref. 12, p. 67). These tars contain many of the compounds that are present in coal tar (Ref. 12, pp. 67 and 145). Coal tars principally contain aromatic hydrcarbons: benzene, naphthalene, anthracene, and related compounds (Ref. 12, p. 145). Coal tars also contain phenolics and tar bases, which water-gas tars lack (Ref. 12, p. 145). Tars generated from gas manufacture contain high concentrations of carcinogenic compounds, such as PAHs (Ref. 12, p. 227).

A City of Bremerton stormwater outfall is located approximately 15 to 20 feet to the east of the concrete pipe outfall (i.e., Source 1) (Ref. 4, pp. 15 and 27). This outfall is known to have overflowed at least once (Ref. 18, p. 38). Potential contaminants associated with the outfall have not been documented. No samples were collected from this outfall during the TBA or the ERA and no sediment samples have been collected between this outfall and the concrete pipe (i.e., Source 1) (Ref. 5, p. 3; Ref. 7, p. 24). During the November 2010 RA, an Organo-Clay mat was reported to be placed over impacted sediments near the terminus of the concrete pipe that had been observed to generate sheen with only minimal disturbance (Ref. 4, pp. 8 and 25). The mat did not extend to the City of Bremerton stormwater outfall indicating that sediments near this outfall did not display visual evidence of contamination (Ref. 4, p. 25). Additionally, during the 2008 EPA TBA event, evidence of visible contamination was noted near sample locations WN01SD, WN02SD, and WN03SD, which are west (on the opposite side) of the location of the Source 1 concrete pipe (Ref. 7, pp. 23, 49-50, 53-54; Ref. 17, p. 21; Figure 1). For this reason, the City of Bremerton stormwater outfall is not considered a likely source of visible sediment contamination.

SC Fuels is located across Pennsylvania Avenue (at 1702 Pennsylvania Avenue) from Bremerton Gasworks (Ref. 18, pp. 7, 8 and 14). ASTs are located on this property and provide businesses and homes with products received from Union 76 (i.e., the suppler) to home heating oil [tanks] (Ref. 18, p. 44). This facility is still active and commenced operations in the mid-1940s (Ref. 4, p. 6). Although products (i.e., heating oil) handled at SC Fuels have some of same constituents (i.e., PAHs) (Ref. 22, p. 105) as those found at observed release concentrations in sediments near Source 1, there is no documented evidence of a release from this facility to sediments.

Two additional petroleum storage and distribution facilities were formerly present in the immediate vicinity of the Bremerton Gasworks (Ref. 4, p. 6). These facilities included: a facility located on the South Bremerton Gasworks Property, in operation between approximately the early to mid-1940s to approximately 1993; and a facility located southwest of the former MGP in operation between 1942 and 1992 (Ref. 4, p. 6; Ref. 26, p. 1). The plant on the South Bremerton Gasworks Property included at least 10 ASTs and two unloading racks which have been removed (Ref. 21, p. 7; Ref. 26, p. 1). An underground fuel pipeline (currently abandoned) connected the three petroleum storage and distribution facilities in the vicinity of the former MGP to a common fuel dock formerly located north of the Bremerton Gasworks (Ref. 21, p. 7; Ref. 26, p. 1). Portions of the petroleum piping were removed in the 1980s or 1990s (Ref. 21, p. 7).

The historical coal gasification plant included approximately 17 petroleum ASTs, which have since been removed (Ref. 21, pp. 6 and 7). Gasoline and diesel products contain some of the same constituents as those detected in Source 1 such as benzene, toluene, xylene, and lead for gasoline (Ref. 23, p. 1); and PAHs for diesel (Ref. 22, p. 105). Although petroleum products and heavy metals may have been released to subsurface soils, and may be migrating through ground water to surface water, it is clear that Source 1 is releasing hazardous substances to Port Washington Narrows (see Section 4.1.2.1.1). Only those substances associated with characteristics similar to coal tar are being used in this documentation record (Ref. 11, pp. 225 – 228).

<u>Hazardous Substances Released</u>
The hazardous substances found in observed releases by direct observation and/or chemical analysis to surface water bodies within the TDL are naphthalene, 2-methylnaphthalene, acenaphthene, anthracene, benz(a)anthracene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, benzo(a)pyrene, carbazole, chrysene, dibenz(a,h)anthracene, dibenzofuran, fluorene, fluoranthene, phenanthrene, and pyrene.

Observed Release Factor Value: 550

4.1.3.2 WASTE CHARACTERISTICS
4.1.3.2.1 Toxicity/Persistence/Bioaccumulation

Table 5 below provides Human Food Chain Threat Waste Characteristics Factor Values for those hazardous substances present in the source at the Bremerton Gasworks facility (see Section 2.2).

Table 5 Human Food Chain Threat Waste Characteristics Factor Values

Hazardous Substance	Source	Toxicity Factor Value	Persistence Factor Value[a]	Bioaccumulation Factor Value[b]	Toxicity/Persistence/Bioaccumulation Value (Ref. 1, p. 51619 Table 4-16)	Reference
Naphthalene	1	1,000	0.4	5,000	2×10^6	Ref. 2, p. BI-9
2-Methylnaphthalene	1	0	0.4	50,000	0	Ref. 2, p. BI-9
Acenaphthene	1	10	0.4	500	2,000	Ref. 2, BI-1
Anthracene	1	10	0.4	50,000	2×10^5	Ref. 2, BI-1
Benz(a)anthracene	1	1,000	1	50,000	5×10^7	Ref. 2, p. BI-2
Benzo(g,h,i)perylene	1	0	1	50,000	0	Ref. 2, p. BI-2
Benzo(k)fluoranthene	1	100	1	50,000	5×10^6	Ref. 2, p. BI-2
Benzo(a)pyrene	1	10,000	1	50,000	5×10^8	Ref. 2, p. BI-2
Carbazole	1	1,000	0.4	500	2×10^5	Ref. 2, p. BI-2
Chrysene	1	10	1	5	50	Ref. 2, p. BI-3
Dibenz(a,h)anthracene	1	10,000	1	50,000	5×10^8	Ref. 2, p. BI-4
Dibenzofuran	1	1,000	1	500	5×10^5	Ref. 2, p. BI-4
Fluorene	1	100	1	500	50,000	Ref. 2, p. BI-6
Phenanthrene	1	0	0.4	5,000	0	Ref. 2, p. BI-9
Pyrene	1	100	1	5,000	5×10^5	Ref. 2, p. BI-10

a. River persistence value (Ref. 2; Ref. 25).
b. Food chain bioaccumulation values for salt water (Ref. 1, p. 51617; Ref. 2; Ref. 25).

The hazardous substances having the highest Toxicity/Persistence/Bioaccumulation Value of 5×10^8 are benzo(a)pyrene and dibenz(a,h)anthracene.

Toxicity/Persistence/Bioaccumulation Factor Value: 5×10^8

4.1.3.2.2 Hazardous Waste Quantity

Table 6 Hazardous Waste Quantity		
Source No.	**Source Type**	**Source Hazardous Waste Quantity**
1. Concrete Pipe Outfall	Other	>0

Targets within the surface water migration pathway are subject to Level II concentrations (see Section 4.1.3.3.2.2 below) and source hazardous constituent quantity is not complete (see Section 2.4.2.1.1). A Hazardous Waste Quantity Factor Value of 100 is assigned (Ref. 1, pp. 51591 and 51592).

Hazardous Waste Quantity Factor Value (Ref. 1, p. 51591, Table 2-6): 100

4.1.3.2.3 Waste Characteristics Factor Category Value

Toxicity/Persistence Factor Value: 10,000
Hazardous Waste Quantity Factor Value: 100

Toxicity/Persistence Factor Value x Hazardous Waste Quantity Factor Value: 1×10^{6}

(Toxicity/Persistence Factor Value x Hazardous Waste Quantity Factor Value) x
Bioaccumulation Factor Value: 5×10^{10} subject to a maximum value of 1×10^{12} (Ref. 1, p. 51620)

Waste Characteristics Factor Category Value (Ref. 1, p. 51592, Table 2-7): 320

Hazardous Waste Quantity Factor Value: 100
Waste Characteristics Factor Category Value: 320
Ref. 1, p. 51592, Table 2-7

4.1.3.3 HUMAN FOOD CHAIN TARGETS

4.1.3.3.1 Food Chain Individual

Level I Concentrations
Level I concentrations for the Human Food Chain Threat is not being scored.

Level II Concentrations –

A fishery has historically occurred in the zone of actual contamination (Ref. 25, p. 1). The Bremerton Gasworks site is situated within the Suquamish Tribe's usual and accustomed fishing area. Within that area, the Tribe has treaty-reserved fishing rights and is a co-manager of fishery resources with the State of Washington. (Ref. 25, pp. 1-2; Ref. 35, p. 1). A food chain individual factor value of 45 is assigned because a fishery is subject to Level II concentrations.

Potential Contamination –

Potential Contamination for the Human Food Chain Threat is not being scored.

Food Chain Individual Factor Value: 45
Ref. 1, p. 51620

4.1.3.3.2 Population

4.1.3.3.2.1 Level I Concentrations

Not scored.

Level I Concentrations Factor Value: 0

4.1.3.3.2.2 Level II Concentrations

Subsistence fishing has historically occurred in the zone of actual contamination and is within the Suquamish Tribe's usual and accustomed fishing area (Ref. 25, p. 1; Ref. 35, p. 1). The amount of fish catch is unknown but greater than zero pounds per year. A value of 0.03 is assigned to Level II concentrations.

Level II Concentrations Human Food Chain Factor Value: 0.03
Ref. 1, p. 51621

4.1.3.3.2.3 Potential Human Food Chain Contamination

Commercial treaty and non-treaty fish and shellfish harvest data is recorded by the Washington State Department of Fish and Wildlife (Ref.32, p. 1). Commercial catch data is reported in pounds by statistical area (Ref. 32, p. 2). The most recent year for which commercial data is available is 2009 (Ref. 32, p. 1). The statistical areas that are present within the 15-mile TDL include area 10 – Seattle, 42K – Port Orchard, 26B – Seattle-Port Madison, 26C – Port Orchard, and 42A – Bremerton (Ref. 20, p. 3; Ref. 32, pp. 2, 7; Ref. 33, p. 1; Ref. 34, p. 1). It is estimated that 75% of these statistical areas are within the TDL. Because commercial catch data is reported by statistical area, the pounds harvested is multiplied by the percentage of the statistical area within the TDL to determine fish catch. Commercial fish catch data by species is presented in Table 7.

Table 7
Commercial Treaty and Non-Treaty Fish and Shellfish Harvest
Ref. 32, p. 2

Species	**Total Pounds of Fish (a)**	**Percent within TDL (b)**	**Pounds Harvested within the TDL (a x b)**
Atlantic Salmon Aquaculture	12,367,744	75%	9,275,808
Chinook salmon	21	75%	15.75
Chum salmon	735,732	75%	551,799
Coho salmon	1,879	75%	1,409.25
Pink salmon	347,410	75%	260,557.5
Silver smelt	3,513	75%	2,634.75
Steelhead	7	75%	5.25
Dungeness crab	89,399	75%	67,049.25
Geoduck clams	869,580	75%	652,185
Horse clams	1	75%	0.75
Manila clams	97,435	75%	73,076.25
Native Littleneck clams	1,454	75%	1,090.5
Pacific oyster	4,565	75%	3,423.75
Sea cucumber	21,962	75%	16,471.5
Spots shrimp	9,629	75%	7,221.75
Total			**10,912,748.25**

Table 8 indicates the calculation for Potential Human Food Chain Contamination Factor Value.

Table 8
Potential Human Food Chain Contamination Factor Value Calculation

Pounds Harvested	**Human Food Chain Population Value**	**Dilution Weight**	**Dilution Weighted Target Value**	**Reference**
10,912,748.25	31,000	0.0001	3.1	Ref. 1, pp. 51613, 51614, and 51621, Ref. 32, p. 2
Total dilution weighted target value			3.1 / 10 = 0.31	

Potential Human Food Chain Contamination Factor Value: 0.31
Ref. 1, p. 51621

4.1.4.2 WASTE CHARACTERISTICS
4.1.4.2.1 Ecosystem Toxicity/Persistence/Bioaccumulation

Table 9 below provides Environmental Threat Waste Characteristics Factor Values for those hazardous substances present in the source at the Bremerton Gasworks facility (see Section 2.2).

Table 9 Environmental Threat Waste Characteristics Factor Values

Hazardous Substance	Source	Ecosystem Toxicity Factor Value [a]	Persistence Factor Value [b]	Environmental Bioaccumulation Factor Value [c]	Ecosystem Toxicity/Persistence/Environmental Bioaccumulation Value (Ref. 1, p. 51619, Table 4-16)	Reference
Naphthalene	1	1,000	0.4	5,000	2×10^6	Ref. 2, p. BI-9
2-Methylnaphthalene	1	1,000	0.4	50,000	2×10^7	Ref. 2, p. BI-9
Acenaphthene	1	1,000	0.4	500	2×10^5	Ref. 2, BI-1
Anthracene	1	10,000	0.4	50,000	2×10^8	Ref. 2, BI-1
Benz(a)anthracene	1	10,000	1	50,000	5×10^8	Ref. 2, p. BI-2
Benzo(g,h,i)perylene	1	0	1	50,000	0	Ref. 2, p. BI-2
Benzo(k)fluoranthene	1	0	1	50,000	0	Ref. 2, p. BI-2
Benzo(a)pyrene	1	1,000	1	50,000	5×10^7	Ref. 2, p. BI-2
Carbazole	1	1,000	0.4	500	2×10^5	Ref. 2, p. BI-2
Chrysene	1	1,000	1	500	5×10^5	Ref. 2, p. BI-3
Dibenz(a,h)anthracene	1	0	1	50,000	0	Ref. 2, p. BI-4
Dibenzofuran	1	1,000	1	500	5×10^5	Ref. 2, p. BI-4
Fluorene	1	1,000	1	5,000	5×10^6	Ref. 2, p. BI-6
Phenanthrene	1	10,000	0.4	5,000	2×10^7	Ref. 2, p. BI-9
Pyrene	1	10,000	1	5,000	5×10^7	Ref. 2, p. BI-10

a. Salt water values (Ref. 1, p. 51621; Ref. 2; Ref. 25).
b. River persistence values (Ref. 2; Ref. 25).
c. Salt water values (Ref. 1, p. 51622; Ref. 2; Ref. 25).

The hazardous substance having the highest Ecosystem Toxicity/Persistence/Environmental Bioaccumulation Factor value of 5×10^8 is benz(a)anthracene.

Ecosystem Toxicity/Persistence/Bioaccumulation Factor Value: 5×10^8

4.1.4.2.2 Hazardous Waste Quantity

Table 10 Hazardous Waste Quantity		
Source No.	**Source Type**	**Source Hazardous Waste Quantity**
1. Concrete Pipe Outfall	Other	>0

Targets within the surface water migration pathway are subject to Level II concentrations (see Section 4.1.4.3.1.2 below) and source hazardous constituent quantity is not complete (see Section 2.4.2.1.1). A Hazardous Waste Quantity Factor Value of 100 is assigned (Ref. 1, pp. 51591 and 51592).

Hazardous Waste Quantity Factor Value (Ref. 1, p. 51591, Table 2-6): 100

4.1.4.2.3 Waste Characteristics Factor Category Value

Ecosystem Toxicity/Persistence Factor Value: 10,000
Hazardous Waste Quantity Factor Value: 100

Ecosystem Toxicity/Persistence Factor Value x Hazardous Waste Quantity Factor Value: 1×10^{6}

(Ecosystem Toxicity/Persistence Factor Value x Hazardous Waste Quantity Factor Value) x Environmental Bioaccumulation Factor Value: 5×10^{10} subject to a maximum value of 1×10^{12}

Waste Characteristics Factor Category Value (Ref. 1, p. 51592, Table 2-7): 320

4.1.4.3 ENVIRONMENTAL THREAT – TARGETS

Level I concentrations for the Environmental Threat is not being scored.

4.1.4.3.1 Sensitive Environments

4.1.4.3.1.1 Level I Concentrations

<u>Sensitive Environments</u>

Not scored.

<u>Wetlands</u>

Not scored.

Level I Concentrations Factor Value: 0

4.1.4.3.1.2 Level II Concentrations

Sensitive Environments

A zone of actual contamination subject to Level II concentrations is present along Port Washington Narrows as described by contaminated sample points WN01SD, WN02SD, WN03SD, WN04SD, GL03E01, GL03W01, GL03W02, GL04E01, GL04E02, GL04W01, GL04W02, GL04W03, GL05E01, GL05E02, GL05E03, GL05W01, GL05W02, GL05W03, GL06E01, GL06E02, GL06E03, GL06W01, GL06W02, and GL06W03 (see section 4.1.2.1.1 and Ref. 10). This zone of actual contamination lies within the critical habitat for the Federal-listed threatened Puget Sound Evolutionary Significant Unit (ESU) Chinook salmon (Ref. 20, pp. 2 and 3) (see Table 11 below). Additionally, the Federal-listed threatened Puget Sound ESU Steelhead is known to be present within the zone of actual contamination (Ref. 20, pp. 2 and 3; Ref. 29, pp. 1 - 3) (See Table 14 below).

Table 11
Species Subject to Level II Concentrations

Sensitive Environment	Distance from PPE to Nearest Sensitive Environment	Sensitive Environment Value (Ref. 1, Table 4-23)	References
Critical Habitat for the Federal-listed threatened Chinook salmon *(oncorhynchus tshawytscha)*	0 feet	100	Ref. 20, pp. 2 and 3; Ref. 29, pp. 1 -3
Habitat known to be used by the Federal-listed threatened Steelhead (*Oncorhynchus mykiss)*	0 feet	75	Ref. 20, p. 2; Ref. 29, pp. 1 -3
Sum of Values			**175**

Wetlands

Not scored.

Sum of Level II Sensitive Environments Value + Wetlands Value: 175 + 0 (not scored) = 175

Level II Concentrations Factor Value: 175
Ref. 1, p. 51625

4.1.4.3.1.3 Potential Contamination

Potential Sensitive Environment Targets

Not Scored.

Potential Wetland Frontages

Not scored.

Potential Contamination Factor Value: 0